

Problems of materials management in the casting industry

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Abstract

The article contains the analysis of influent factors on taking into account of needs materials in the casting institution . Performs the essential meaning especially in the chance of the material requirement, raw materials, parts to the production on which the demand is relative to the demand on the definite final product.

In foundries one uses different methods and technicses planning needs of materials adapted to current circumstances of the given firm. At the choice the method planning one takes into account in general different factors, and particularly the type of the production and connected with this the length of the production cycle.

Keywords: Planning; Management; Foundry, Loamy sand, Cast iron scrap metal

1. Introduction

The planning and the steering with resources of materials in the foundry (leaning for cupolas) to the determines the connection into one complex system of such ranges as the expectation and qualifying size orders time-limits of deliveries materials, qualifying size of the productive party , qualifying moments of beginning the production and the volume of stocks in magazines and in process of producing.

The planning needs of materials plays the essential meaning especially in the chance material requirement, raw materials, parts to the production on which demand is relative to demand on the definite final product.

With the point of view of industrial companies and service- the planning embraces:

- immediate productive indispensable materials exercible of the planned production or services in the foundry, as eg.: the casting gear , the loamy sand, the casting salad , cast iron scrap metal , casting coke ,

- auxiliary necessary materials to correct holding of the production cycle, as eg. modifiers, protective coverings on forms, spare parts to machines and devices, etc.

2. Methods of planning needs the materials

In foundries one uses different methods and technicses of planning needs of materials adapted to current conditions given firm. At the choice of the method planning one takes into account in general different factors, and particularly the type of the production (mass, serial or individual) and connected with this the length of the production cycle [1]. Important the part perform also:

- the character of the waste of materials of directly productive (the casting salad , the loamy sand) and auxiliary materials [2],
- the number of the assortment of materials,

- sources of the purchase of materials and connected with this conditions of deliveries.

Exchanged factors indeed bear on the circumstantiality and the technics of planning and the rightness of settlements of the plan of the supply. Needs of materials (P_m) mark three basic elements:

planning waste of materials – P_z
 the settled reserve of the safety – Z_B ,
 real wrestling for starters the period embraced with the plan – Z_P .

Among these elements happens the following dependence:

$$P_m = P_z + Z_B - Z_P \quad (1)$$

This dependence can be achieved both to planning of ordering on the definite assortment materials, as and groups of materials or wholes needs of materials the institution. A base of planning needs of materials is the planning waste of materials. In the dependence from the character of the waste materials (basic materials or auxiliary) one uses different methods and technics planning.

The waste of basic requisite materials exercible of the planned production one qualifies on the ground productive plans and the constructional structure of products and norms of the waste [4].

Planning waste of basic materials qualifies the dependence:

$$P_z = S \cdot N_z \quad (2)$$

P_z – planning waste of materials in the given period,
 S – the volume of output of casts in the given period,
 N_z – the waste of materials on the individual of the article-the cast

In case of assembly- processes understood as the joining of elements of components (eg. details, teams) into the article the base computable the waste of materials to the determineslist of materials. This is the description of the complexity choice perfect by the development of his constructional structure, and then adding up of repeated elements and single placing their in the description[4]. The list of materials appears in two changes: analytic, where materials assembled are according to elements in which appear, and synthetic in which are contracted all component materials of the ready cast.

For manufacturing processes understood as processes in which follows the change of the propriety physics, shapes, measurements etc. the planning of the waste of materials one marks from the example:

$$P_z = S \cdot N_t \quad (3)$$

P_z – planning waste of materials in the given period,
 S – the volume of output of casts in the given period,
 N_t – the technical norm of the waste of materials.

The norm of the waste, obtaining with the influent factor directly on the formation himself the size of the waste of materials, should be leaning on technical premises. From this regard to counting of individual norms of the waste one complies suitable formulas taking into account proprieties of materials and processings. Every norm is based on the same rule: to the quantity of material, what contains the article, it is necessary to add the sum of surpluses the answering size of well-founded losses and technological waste material.

A second element of the plan of needs materials is the reserve of the safety. He there qualifies the quantity of the given kind of indispensable material to assuring of the continuity production in the period among two following deliveries. In the chance of normalizing of wrestling this is the reserve of concrete material accepted as the norm for the given period. It is necessary holdings the definite level of reserve she gets out of instabilities conditions working firm due eg. with the variability of the material requirement, with the inequality and not regularity of deliveries.

From here many firms holds the certain size of the reserve as the buffer or the reserve of the safety in case the appearance of disturbances in the realization deliveries or committed errors at prognosing of ordering.

An essential matter becomes so the settlement level of the reserve safety.

Accordingly one can use following resources.:

- leaning on the length of the time of the delivery on the reproduction of the state of the reserve
- leaning on using of the theory of the statistics

In the first chance {case} on the ground given from the past settles accounts {counts} the average application on material in the period {term} among two deliveries and one values the maximum application on products [4].

The level of the reserve of the safety must be at this so large, to cover the difference between the average and maximum application. Thus the level of the reserve of the safety one can introduce {represent} as the function of the time of the re-delivery:

$$Z_B = (P_{\max} - P_0) \cdot T \quad (4)$$

Z_B – the level of the reserve of the safety,
 P_{\max} – the maximum application on the time unit,
 P_0 – the maximum application on the time unit,
 T – the time of the delivery.

To them the shorter time of the delivery materials, this smaller can be the level of the reserve safety.

In the second chance it finds that the level of the reserve safety is relative to sizes of the error, prognosings and probabilities his appearances [5,6]. The probability that the size of ordering will cross the given stock level under of the given cycle of deliveries, is fixed by means the normal distribution.

In effect industrial complies simplified manners of valuing of the level of the reserve of the safety enlarging about one the percentage size of the delivery, eg. for strategic materials 10, 20%, remaining materials for 5%.

A source and the formation for the qualification of real wrestling is the report from the state materials prepared on the ground passed inspection state of materials.

Characterizing different manners and methods of planning one cannot get over to the method planning of needs materials on the ground prognosed demand or orders of customers with the called method MRP .

Fundamentals of this method are based for prognosing to which is subject exclusively the demand on final goods (the independent demand). Instead needs of materials (the dependent demand) counted are directly on the ground structures of the article.

An important element of progressing is the partition on needs the gross and net. Needs the gross this are the need in the range of materials and elements of products consequential from the efficient plan of production and different norms; they qualify the kind and the quantity of materials and necessary elements to the course of the manufacturing process. Needs net answer materials to components really with the serf to converting in the given period .

The settlement of needs of grosses materials and net the state the certain synchronization in fixing of sections of the time of ordering on the given assortment, with the simultaneous co-ordination of time-limits of this ordering and time-limits of the composition of ordering. Knowing the cycle of the realization of orders from external tradesmen be also the cycle of the realization of internal (the length of the production cycle) orders one can very sensitively qualify the time-limit of ordering materials.

This method lets on the very precise settlement of the moment of appearing of ordering on the given element, but also permits to size up this ordering. A fundamental of this method is the minimization of stoks [4].

3. Manners steering with supply of materials

The management with supply of materials demands takings into account of following problems:

- the choice of entrance- materials for which should be held stokeat present and in the future,
- sizes of the party of deliveries,
- the cycle of deliveries,
- the qualification of the situation in which one can throw up holdings of supply.

One ought also to take into account the fact that every reserve whose the support is whatever well-founded, can consist of three parts: the reserve rotators, the reserve of the safety and the excessive[7] reserve .

The reserve rotatory, running his definite size is a size of deliveries Q and the running waste:

$$Z_R = 0,5 \cdot Q \quad (5)$$

The reserve of the safety - his size qualify following factors [5]:

- the length of the cycle of the delivery on the reproduction of the state of supply,

- the probability of the offence of the time of the delivery and sizes of the delivery,
- the number of magazines.

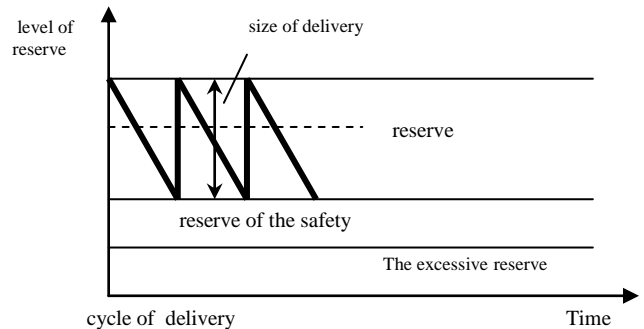


Fig. 1. Basic comprehendings of steering with supply [7]

The excessive reserve is the reserve adding costs (mostly floating charges of holding of wrestling), and carrying in no of run-on to the all process [7].

The formation the stock level is dependent from used method of steering wrestling.

One can favour two core groups of methods of steering with wrestling in the area of the supply:

- leaning methods on prognosing statistical,
- the method of planning of needs of materials MRP.

4. Models of steering with store

In the process of steering with stoke plans needs of materials to be fly's taken place with plans of deliveries. Demands this the qualification two basic parameters of steering:

- sizes of deliveries (sizes of ordering Q)- the quantitative aspect,
- the cycle of deliveries (the lead time of ordering indispensable to the qualification of the time-limit composition of ordering - T) the temporary aspect.

The leaning model up to the mark the reserve marking the moment of ordering

This method is characterized with the constant quantity of ordered materials in the moment, when the level of the reserve will drop to the point of the reorder. Sharp the reorder (ROP) this is the level of the reserve sufficient to satisfying of needs to the time of the next delivery. The cycle of the delivery is a variable size . This model demands settlements of two sizes :

- sizes of the delivery,
- the level of the reserve informing about the need the composition of ordering.

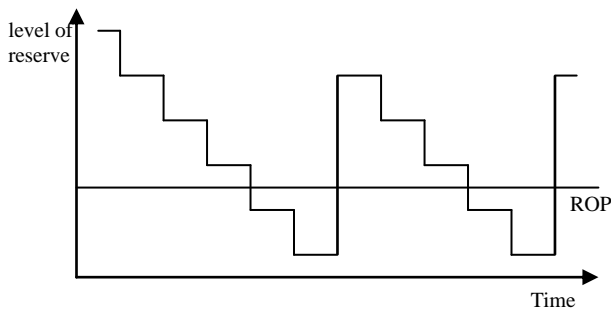


Fig. 2. The model of steering leaning on punctures ROP [3]

In compliance with with rules of the model the composition of ordering follows in the moment, when the factual reserve in the supply (enlarged for the possible delivery in the way) will drop to the level ROP. In turn ordered size is the solid and gets out of the optimum- size of deliveries.

The model of the solid cycle of ordering

In this method stoks inspected are in settled moments of the time, and the order is folding in the definite cycle about the solid period. The size of ordering is variable and appointed a difference among a level of the reserve, a called maximum reserve With t_{\max} and an actual state of affairs of the foundry. The model demands calculations of two sizes :

- the level of the maximum reserve $Z_{t_{\max}}$
- the cycle of the review T_c , that is to say lengths of the time among following inspections.

The level of the maximum reserve settles accounts from the example:

$$Z_{t_{\max}} = y_t(T_c + T_{sr}) + k \cdot \delta \sqrt{(T_c + T_{sr})} \quad (6)$$

y_t – the prognosis of the size of needs in the individual period ,
 T_c – the cycle of the review,
 T_{sr} – the average observed lead time of ordering,
 k – the consequential size from the accepted coefficient of the risk
 δ - the standard deviation.

The cycle of the review T_c one marks from the example:

$$T_c = \frac{t \cdot Q_{opt}}{R} \quad (7)$$

t – time expressed in suitable individuals (eg. 52 weeks)

Q_{opt} – the optimum- size of delivery,

R – the one year's size of ordering.

To with the basic leaning idea on Q_{opt} this model does not demand the precise observation the stock level, what an effect are lower costs of the monitoring of stores [4].

5. Summary

The efficient management with the supply in the foundry demands undertakings in being developed to the market economy of strategic decisions, permissive to adapt possibilities of the institution to the given production cycle. The planning of ordering of materials in the casting- industry is leaning on three basic kinds of demand: primary, secondary and supplementary. To planning of needs materials the firm one uses the conventional method or the method MRP. Both methods demand compact tying size needs of materials with productive plans of foundry. The method MRP to conventional lets on the very precise settlement of the moment appearing of ordering on given material and sizes of ordering, what lets on the minimization of requisite supply to the realization of the definite party of foundings.

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